

## CHAPTER – 1

### INTRODUCTION

Stroke or brain attack is the sudden loss of neurological function caused by an interruption of the blood flow to the brain. Ischemic stroke is the most common type affecting about 80 percent of individuals with stroke and results when a clot blocks blood flow depriving the brain of essential oxygen and nutrients. Hemorrhagic stroke occurs when blood vessels rupture, causing leakage of blood in or around the brain. (**Susan B. O Sullivan, Schmitz 2007** ).

At younger ages, men are more likely than women to have strokes. However, women are more likely to die from strokes. Women who take birth control pills also are at slightly higher risk of stroke. ( **Scott E Kasner 2014** ).

The incidence of stroke increase exponentially from 30 years of age and etiology varies by age 95% of stroke occurs to people aged 45 and older according to the world health organization, 15 million people suffer with stroke worldwide each year, of these 5 million will die and another 5 millions are disabled. (**Aho et al.,2003**).

The symptoms of a stroke may begin suddenly or develop over hours or days, depending upon the type of stroke. In stroke, one or more areas of the brain can be damaged. Depending upon the area affected, a person may lose the ability to move one side of the body, the ability to speak, or a number of other functions. The damage from a stroke may be temporary or permanent. A person's long term outcome depends upon brain damage, the way quickly treatment begins, and several other factors. (**Louis R Caplan 2015**).

Anterior cerebral artery (ACA) territory infarcts are much less common than middle or posterior cerebral artery territory infarcts, Embolic strokes are the most common cause. Rarely, they are also seen as a complication of severe midline shift, it is occluded by mass effect or vasospasm. (elisa et al., 2007)

Middle cerebral artery stroke is an interruption of blood flow to the areas of the brain that receive blood through the middle cerebral artery. If the whole entire middle cerebral artery is blocked, then that is a large vessel stroke that affects the whole entire middle cerebral artery territory which is every region of the brain that receives blood through the middle cerebral artery. A middle cerebral artery stroke causes a language deficit, weakness on the opposite side of the body, a sensory deficit on the opposite side of the body and vision defects. The most common characteristics of MCA are upper extremities is involved than lower extremities. (Heidi moawad, 2009)

In the majority of stroke patients, the upper limb is more severely involved than the lower limb, as most strokes occur in the territory of the middle cerebral artery. From an initial state of flaccid weakness after stroke, some patients regain varying degrees of isolated upper limb movements, some recover only mass flexion-extension synergistic movements, and some do not recover any significant voluntary upper limb movements. The sparing of specific brain regions must occur to allow for recovery of synergistic or isolated voluntary upper limb movements. It is generally assumed that those recovering isolated upper limb movements have small, incomplete lesions affecting the corticospinal tract. Those who recover only synergistic upper limb movements are assumed to have relatively complete lesions affecting the corticospinal tract but have preservation of efferents to reticulospinal, rubrospinal, and vestibulospinal nuclei in the brain stem. Patients without significant upper limb

motor recovery presumably have lost primary motor, premotor, and supplementary motor control of lower motor neuron groups.(**Fatima .D.N 2009**).

Rehabilitation is probably one of the most important phases of recovery for many stroke survivors. Stroke rehabilitation helps to return independent living. Its goals are to build your strength, capability and confidence to continue our daily activities despite the effects of Physiotherapists should be involved early, and should make their own assessment of how much can work with a patient. Early mobilisation is associated with better outcomes even after taking account of the potential confounding influence of disease severity. If rehabilitation is to take place on a different ward from acute care, the care received should be made as seamless as possible. Type and intensity of therapy should be determined by the patient's.

The presence of excessive trunk movement in hemiparetic individuals while reaching may limit the potential recovery of normal arm movement patterns . However, limiting trunk motion in patients after stroke has been shown to encourage more normal elbow and shoulder motion during reach to grasp objects (**salah.A.sawan 2012**).

Reaching movements made with the affected arm in hemiparetic patients are often accompanied by compensatory trunk or shoulder girdle movements,which extend the reach of the arm.Restriction of compensatory trunk movements may encourage recovery of normal reaching patterns in the hemiparetic arm when reaching for objects placed within arm's length (**Michaelsen & Levin 2004**).

Physiotherapy interventions for stroke consist of conventional therapies,proprioceptive neuromuscular facilitation, motor relearning programme,bobath therapy,constraint induced movement therapy,mirror box therapy.

The Motor Relearning Programme (MRP) is a task-oriented approach to improving motor control, focusing on the relearning of daily activities. It is strongly based on theories in kinesiology that emphasize a distributed motor control model. **(Janet Carr and Roberta ,2011)**

The purpose of the application of trunk restraint during the practice of upper limb tasks is to improve arm motor function by providing more appropriate afferent information to the central nervous system from the affected arm to facilitate the reappearance of more efficient premorbid movement pattern.**(Levin et al., 2002)**

There are various scales used to measure upper arm function for stroke which includes action research arm test, barthel index, berg balance scale, box and block test, functional ambulation categories, functional independence measure, motor assessment scale, nine hole peg test. In this present study, explained about chedoke mc master scale.

The Chedoke Arm and Hand Activity Inventory (CAHAI) measure was developed to provide a valid, clinically relevant means of assessment for the recovering paretic limb. The 5 main objectives of the test are: 1) to discriminate between different categories of upper limb dysfunction; 2) to predict anticipated functional recovery in the paretic upper limb; 3) to quantify the amount of change in upper limb function; 4) to determine the importance of that change to stroke survivors; and 5) to serve as a guide to treatment.**(Barreca et al. 2004)**

### **1.1statement of the study**

A comparative study on the the effectiveness of motor relearning programme with runk restraint and without trunk restraint on improving upper limb functional activities among stroke patients.

### **1.2 Objectives of the study**

To evaluate the effectiveness of motor relearning programme with trunk restraint in the management of upper limb functional activities among stroke patients.

To evaluate the effectiveness of motor relearning programme without trunk restraint in the management of upper limb functional activities among stroke patients

To compare the effectiveness of motor relearning programme with trunk restraint and without trunk restraint in the management of upper limb functional activities among stroke patients

### **1.3 Hypothesis**

The following hypothesis is framed for the study,

It is hypothesized that there is no significant difference in motor relearning programme with trunk restraint in the management of upper limb functional activities among stroke patients

It is hypothesized that there is no significant difference in motor relearning programme in the management of upper limb functional activities among stroke patients.

It is hypothesized that there is significant difference between motor relearning programme with trunk restraint and without trunk restraint on improving of upper limb functional activities among stroke patients.

## **1.4 OPERATIONAL DEFINITIONS**

### **Stroke :**

A stroke is defined as the interruption of the blood supply to the brain, usually because a blood vessel bursts or is blocked by a clot. This cuts off the supply of oxygen and nutrients, causing damage to the brain tissue. ( Evi sideri 2015)

### **Motor relearning programme:**

It is a task-oriented approach to improving motor control, focusing on the relearning of daily activities. It is strongly based on theories in kinesiology that emphasize a distributed motor control model ( Janet Carr and Roberta Shepherd).

### **Trunk restraint:**

The movements of the trunk are limited by strapping the trunk to the back of a chair. The trunk restraint limits forward and lateral trunk displacement and rotation but allows scapular movement.( Mindy F. Levin 2009)

### **ADL (activities of daily living):**

The things we normally do in daily living including any daily activity we perform for self-care such as feeding ourselves, bathing, dressing, grooming, work, homemaking, and leisure. The ability or inability to perform ADLs can be used as a very practical measure of ability/disability in many disorders.(warren 2002)

### **Chedoke mc master scale:**

The scale used to evaluate the functional ability of hemiplegic arm and hand function to perform a tasks.(ms.braccia et al.,2004)

## **CHAPTER - 2**

### **REVIEW OF LITERATURE**

**Section A :Study on the effect of motor relearning programme in stroke patients**

**Section:B Study on the effect of chedoke mc master scale inventory**

**Section : C study on the effects of trunk restraint for stroke conditions**

**Section A: Study on the effect of motor relearning programme in stroke patients**

*Jibi paul et al... (2015)* Modulates that stroke is one of the most common neurological diseases that lead to disability in elderly population. Functional impairment of upper limb affects performance of activities in daily life. The primary objective of this study was to investigate and compare the effect of motor relearning program and thermal effect to improve upper limb motor function among stroke subjects. Random sampling method was used to select subjects with right middle cerebral artery stroke. Twenty subjects were included and randomly divided into three groups by using lottery method, ten in each group A and B. Group A trained with MRP and group B with thermal stimulation. The outcomes were measured by the MMAS, and STREAM scale. The present study concluded that physiotherapy treatment by the use of motor relearning program and thermal stimulation are effective technique in improvement of upper limb motor function among Stroke subjects. It has also proved that motor relearning program was more effective on improvement of motor functions in upper limb among MCA Stroke subjects.

***Chen jc et al.,(2015)*** Study about the recent progress in physical therapy of the upper-limb rehabilitation after stroke Poor recovery of arm function after stroke can often have a negative impact on the patient and his/her family. These patients often need assistance from the society and may need to rely on government resources. Numerous therapeutic treatments are currently available for stroke rehabilitation. Traditional rehabilitation strategies (Bobath, Brunnstrom, proprioception neuromuscular facilitation, and motor relearning) have been used for many years to improve function. Recently, we demonstrated that a novel intervention, with trunk restraint facilitated upper-limb functional recovery after stroke. We found that thermal stimulation in combination with motor relearning program was of great benefit to stroke patients. Development of a better rehabilitation paradigm that maximizes rapid recovery of arm function is a priority to help stroke patients and society.

***Martin B warner et al.,(2013)*** Study on 46 patients,60 years of age after cerebral infarction.patients were randomized to receive 15 sessions (1h/d for 5 week).patients were given 15 trained and 5 untrained task including household,cooking and shopping task .patients were engaged in motor relearning programme showed better relearning of both trained and untrained task compared with control group. They concluded that motor relearning programme is to be effective to promote the relearning of daily activities for people after stroke.

***Pandian.s et al.,(2010)*** Study about the hand therapy protocols based on brunnstorm approach and motor relearning program in rehabilitation of the hand of chronic stroke patients.30 post stroke subjects were randomly assigned into equal groups.motor



relearning programme was found to be more effective than BHM, in rehabilitation of the hand in chronic post stroke patients

***Fu quio et al., (2009)*** Study about the effects of motor relearning programme on upper limb motor function and activity of daily living (ADL) were investigated in hemiplegic stroke patients in China. 39 patients with hemiplegic stroke were randomly subdivided into 2 groups: A control group (n=20) and an experimental group (n=21). All patients were treated with routine rehabilitation training. In the experimental group patients were treated with motor relearning programme. All patients were assessed with Fugl-Meyer assessment (FMA) and Modified Bathel Index (MBI) 8 weeks before and after treatment. The scores of FMA and MBI 8 weeks after treatment significantly increased in both groups compared with before treatment ( $P<0.01$ ). The scores of FMA and MBI in the experimental group significantly increased 8 week after treatment compared with the control group ( $P<0.01$ ). It is concluded that motor relearning programme significantly improves the upper limb motor function and ADL in patients with hemiplegic stroke

***Langhammer B and Stanghelle JK (2008):*** Study about the Bobath approach or Motor Relearning Program (MRP) in rehabilitation of acute stroke cause any difference in motor function, activity of daily living (ADL) or quality of life. The two physiotherapy programs were standardised according to background literature. Workshops and discussions were organised with the physiotherapists to co-ordinate treatment according to the two different approaches. The patients in both groups received physiotherapy five days a week for a minimum of 40 minutes while hospitalised. Besides physiotherapy, all patients received the same multidisciplinary treatment according to recommendations for stroke units. After discharge, the aim was to continue the same physiotherapy approach in different settings. The MRP has

small short term benefits in motor function compared with the Bobath approach, and shortens hospital stay.

***Gajanan bhalerao et al.,(2007)*** Conducted the study to find efficacy of the motor relearning approach in promoting physical function and task performance for patients after a stroke. Fifty-two outpatients with either a thrombotic or haemorrhagic stroke who completed either the study or control group. The patients received 18 2-h sessions in six weeks of either the motor relearning programme or a conventional therapy programme. Patients in the motor relearning group showed significantly better performance on all but the Timed Up and Go Test when compared with the control group. The motor relearning programme was found to be effective for enhancing functional recovery of patients who had a stroke. Both 'sequential' and 'function-based' concepts are important in applying the motor relearning approach to the rehabilitation of stroke patients.

***Tam Dickson et al., (2003)*** Modulated the study about the efficacy of the motor relearning approach in promoting upper limb function for patients after a stroke. The patients received six weeks of either the motor relearning programme or a conventional therapy programme. The Berg Balance Scale, the Timed Up and Go Test, the Functional Independence Measure (FIM), the modified Lawton Instrumental Activities of Daily Living (IADL) test, and the Community Integration measures. Patients in the motor relearning group showed significantly better performance on all . The motor relearning programme was found to be effective for enhancing functional recovery of upper limb function of patients who had a stroke.

***Yun.et al., (2002)*** Study to observe the effect of motor relearning program (MRP) on balance function of stroke patients. Methods Sixty stroke patients were randomly divided into the MRP group and control group with 30 cases in each group. The patients of the control group were trained with proprioceptive neuromuscular facilitation (PNF) therapy; those of the MRP group were trained with the MRP therapy. The balance function of all patients was assessed with the Fugl-Meyer Balance Function Assessment before and after training. After training, the scores of Fugl-Meyer Assessment of all patients increased ( $P < 0.05$ ), but scores of the patients of the MRP group were significantly higher than that of the control group ( $P < 0.05$ ). The MRP training can improve the recovery of balance function of stroke patients

***Zhongtang feng et al.,(2000)*** Study about the motor relearning program was conducted for 60 days from the third day after model establishment. Immunohistochemistry and single-photon emission CT showed that the numbers of glial fibrillary acidic protein-, neurofilament protein-, vascular endothelial growth factor-and basic fibroblast growth factor-positive cells were significantly increased in the infarcted side compared with the contralateral hemisphere following the motor relearning program. Moreover, cerebral blood flow in the infarcted side was significantly improved. The clinical rating scale for stroke was used to assess neurological function changes in the rhesus macaque following the motor relearning program. Results showed that motor function was improved, and problems with consciousness, self-care ability and balance function were significantly ameliorated. These findings indicate that the motor relearning program significantly promoted neuronal regeneration, repair and angiogenesis in the surroundings of the infarcted hemisphere, and improve neurological function in the rhesus macaque following brain ischemia.

## **Section:B Study on the effect of chedoke mc master scale inventory**

**Divya midha (2015)** Study about Chedoke arm and hand activity inventory (CAHAI) with time Frame of 4 WEEKS . CAHAI scale is designed to encourage the bilateral hand to complete the task. Patient was made to seat in chair without arm rest and encouraging erect posture with elbows at the edge of the table and hands resting on the table. Each task was demonstrated once before performance, and then the Score was evaluated of the affected upper extremity using the 7 point activity scale from total assistance (1) to complete independence.

**Lam et al.,(2014)** Study to compare the sensitivity of FTHUE-HK and chedoke arm and hand activity inventory on function of hemiplegic upper extremity resulting from stroke.7 subjects suffered from stroke were recruited. All subjects underwent 3-4 weeks standard multidisciplinary stroke rehabilitation in rehabilitation block of tuenmun hospital in hong kong.pre and post assessment were conducted to each subject.This preliminary study echoes the postulates of literature review that chedoke arm and hand activity inventory provides a larger scoring scale.

**Turpin .m et al.,(2011)** Study about the Chedoke Arm and Hand Activity Inventory-9 (CAHAI-9) is an activity-based assessment developed to include relevant functional tasks and to be sensitive to clinically important changes in upper limb function. The aim of this study was to explore both therapists' and clients' views on the clinical utility of CAHAI-9 within 14 days of stroke.Twenty-one therapists actively working in stroke settings were recruited by convenience sampling from 8 hospitals and participated in semi structured focus groups. Five clients within 14 days of stroke were recruited by consecutive sampling from 1 metropolitan hospital and participated in structured individual interviews. The transcripts were analyzed thematically. The

findings indicate that CAHAI-9 shows promise as an upper limb ability assessment for clients within 14 days of stroke.

**Melissae street.,(2011)** Study to estimate the predictive accuracy and clinical usefulness of the Chedoke–McMaster Stroke Assessment (CMSA) predictive equations. A longitudinal prognostic study using historical data obtained from 104 patients admitted post cerebrovascular accident was undertaken. Complete data were available for 74 patients with a mean age of  $65.3 \pm 12.4$  years. The shrinkage values for the six Impairment Inventory (II) dimensions varied from  $-0.05$  to  $0.09$ ; the shrinkage value for the Activity Inventory (AI) was  $0.21$ . The error associated with predictive values was greater than  $\pm 1.5$  stages for the II dimensions and greater than  $\pm 24$  points for the AI. This study shows that the large error associated with the predictions (as defined by the confidence band) for the CMSA II and AI limits their clinical usefulness as a predictive measure.

**Lauren sacks et al., (2010)** study to evaluate the construct validity of the Activity Inventory of the Chedoke-McMaster Stroke Assessment and the Clinical Outcome Variables Scale (COVS), 2 measures of functional mobility. A retrospective longitudinal study of 24 inpatients (mean age 83 years (standard deviation 7)) on a geriatric rehabilitation unit. The primary reasons for admission were deconditioning ( $n=9$ ) and hip fracture ( $n=7$ ). We tested hypotheses that Activity Inventory and COVS scores at admission and discharge, and change scores during hospital stay would correlate. Longitudinal construct validity was also estimated using effect size and standardized response mean. Correlations between scores on each measure ranged from  $r=0.59$ – $0.93$  across subscales and total scales. Although findings support the validity of both measures, the COVS appears more efficient and sensitive than the Activity Inventory to change in this population.

***Gail A.cox steck et al.,(2008)*** Study about Promoting `Force to use it`- Strategies of the Hemiplegic Limbs of a Patient with Severely Impaired Motor Control Following Stroke Improvements occurred in motor recovery, reaching and grasping,standing balance, and gait at both discharge and 9 months post-stroke, evidenced by improved scores on the Chedoke McMasterStroke Assessment (impairments), Tinetti Balance and Mobility Scale, the 3 Minute Walk Test (Olsson) and the Berg Balance Test. These training set-ups can be organised to promote the quality and quantity of functional movements of the hemiparetic limbs while preventing detrimental movement compensations. This poster presents a case report to illustrate how inflatable air splints and supportive positioning can be used to promote autonomous practice and `force to use it`- training for functional rehabilitation of a patient with stroke.

***Gowland et al.,(2008)*** Study about the Chedoke-McMaster Stroke Assessment measures the physical impairments and disabilities that impact on the lives of individuals with stroke, to evaluate the ability of this measure to yield reliable and valid results. Thirty-two subjects from a stroke rehabilitation treatment unit were assessed by research and treating physical therapists using multiple measures on multiple occasions. The measure's three purposes dictated the study objectives and design. This study confirms that the Chedoke-McMaster Stroke Assessment yields both reliable and valid results. With the evaluation study now completed, the Chedoke-McMaster Stroke Assessment can be used with confidence as both a clinical and a research tool that can discriminate among subjects and evaluate patient outcomes.

**Stratford PW et al., (2005)** Study to estimate the test-retest reliability and validity of the Chedoke Arm and Hand Activity Inventory (CAHAI) and to test whether the CAHAI was more sensitive to change in upper-limb function than the Impairment Inventory of the Chedoke-McMaster Stroke Assessment (CMSA) and the Action Research Arm Test (ARAT). High interrater reliability was established with an ICC of .98 Stratified sample of 39 survivors of stroke: 24 early and 15 chronic. The minimal detectable change score was 6.3 CAHAI points. Higher correlations were obtained between the CAHAI and the ARAT and CMSA scores compared with the CMSA shoulder pain scores. High interrater reliability and convergent and discriminant cross-sectional validity were established for the CAHAI. The CAHAI is more sensitive to clinically important change than the ARAT

**Dunkley et al., (2004)** Study was conducted on the effectiveness of Motor Relearning Programme and Mirror Therapy along with Conventional Physiotherapy treatment for improving Hand Function In Patients with stroke. study was an experimental study conducted on 12 stroke patients using convenient sampling method .Subjects were divided into two equal groups (n=6). Group A was given conventional physiotherapy and Motor Relearning Programme exercises for the affected hand and Group B received conventional physiotherapy for the affected hand and mirror therapy for the unaffected hand. Chedoke arm and hand inventory (CAHAI) was used as primary outcome measure for evaluation of hand function before and after application of therapeutic Intervention

**Foley N et al., (2002)** Study to determine the incidence of falls on a stroke rehabilitation unit; to assess the frequency and nature of injuries; and to identify risk factors predictive of falls, functional outcomes, impairments. An inpatient stroke rehabilitation unit. Two hundred thirty-eight consecutive stroke patient

admissions. Incident reports completed on patients who experienced a fall while on the unit were reviewed and resultant injuries categorized. Stroke impairments and admission functional assessments, FIM instrument, Berg Balance Scale (BBS), and Chedoke-McMaster (CM) Stroke Impairment Inventory of fallers were compared with nonfallers. Patients who fell were also more likely to be apraxic ( $P < .014$ ) and suffer from cognitive deficits ( $P < .01$ ). Repeat fallers had lower admission FIM scores ( $P < .01$ ) when compared with nonfallers. Although patients undergoing stroke rehabilitation experienced a significant number of falls, the incidence of serious injury was small. Patients who experienced at least 1 fall had significantly lower BBS, FIM, and CM arm, leg, and foot scores compared with nonfallers. These data suggest that groups of stroke patients who are at risk for falls within the rehabilitation setting can be identified by using a variety of impairment and functional assessments. This information may be potentially useful for designing interventions directed at reducing fall frequency among stroke survivors.

*Charles benaim et al., (1999)* Study about the few clinical tools available for assessment functional abilities are specifically designed for stroke patients. Most have major floor or ceiling effects, and their metrological properties are not always completely known. Normative data obtained in 30 age-matched healthy subjects are presented. The chedoke mc master scale meets the following requirements: (1) good construct validity: high correlation with concomitant Functional Independence Measure (FIM) scores ( $r = 0.73$ ,  $P = .0001$ ), with upper-limb motricity scores ( $r = 0.78$ ,  $P = .0001$ ), and with an instrumental measure of stabilization ( $r = 0.48$ ,  $P = .0022$ ); (2) excellent predictive validity: high correlation between chedoke scores on the 30th day and FIM scores on the 90th day ( $r = 0.75$ ,  $P = .0001$ ); (3) high internal consistency (Cronbach  $\alpha$ -coefficient  $0.95$ ); and (4) high interrater and test-retest reliabilities



(average k50.88 and 0.72). Our results confirm that the Chedoke is one of the most valid and reliable clinical assessments in stroke patients .

### **Section : C study on the effects of trunk restraint for stroke conditions**

**Roberta de oliviera et al., (2015)** Study was to evaluate the long-term effects of the task-specific training with trunk restraint comparing to the free one in post-stroke reaching movements. Twenty hemiparetic chronic stroke patients were selected and randomized into two training groups: Trunk restraint group - TRG (reaching training with trunk restraint) and Trunk free group - TFG (unrestraint reaching). Twenty sessions with forty-five minutes of training were accomplished. The subjects were evaluated in pre-treatment (PRE), post-treatment (POST) and three months after the completed training (RET). The measures administered were the Modified Ashworth Scale, Barthel Index, Fugl-Meyer Scale and kinematic analysis (movement trajectory, velocity, angles). The targets that were ordered in a way that stimulated the complete range of motion of shoulder and elbow, had pictures, colors, letters and numbers on them yielding variability and feedback to the performing tasks. significant difference in the mean values of trunk displacement and elbow extension ROM between GI and GII pre treatment ( $p=0.4967$  and  $p=0.2223$  respectively). There were a statistically very highly significant difference in the mean values of trunk displacement and elbow extension ROM between GI and GII post treatment ( $p=0.0001$  and  $p=0.0002$  respectively) (Table

**Seng kwee wee et al., (2014)** Study about the trunk Restraint to Promote UpperExtremity Recovery in Stroke Patients. A search was conducted through electronic databases from January 1980 to June 2013. Only randomized controlled trials (RCTs) comparing upper extremity training with and without trunk restraint were selected for review. Three review authors independently assessed the methodological quality and extracted data from the studies. Meta-analysis was conducted when there

was sufficient homogenous data. Six RCTs involving 187 chronic stroke patients were identified. Meta-analysis of key outcome measures showed that trunk restraint has a moderate statistically significant effect on improving Fugl-Meyer Upper Extremity (FMA-UE) score, active shoulder flexion, and reduction in trunk displacement during reaching.

**Guilherme borges et al., (2014)** Study about the training based in the motor learning concepts including repetitive and task-specific practice. The selected patients were: Trunk restraint group - TRG (n = 10): reaching training with trunk restraint by a harness that limited the trunk movements. Trunk free group - TFG (n = 10): unrestraint reaching training, only with verbal feedback to maintain the trunk right position. Forty-five training minutes, twice a week, totaling twenty sessions, were performed (The participants will be trained for 10 weeks, and with 3 months of follow-up) Twenty stroke subjects were recruited from the Physiotherapy and Occupational Therapy Outpatient Unit of the University Hospital at Campinas - UNICAMP and all of them signed informed consent forms previously approved by the Research Ethics Committee of the University. Ten healthy subjects were also selected to obtain normal reference parameters of kinematic assessment. Patients had sustained a single and chronic (>6 months post-event) unilateral stroke of non-traumatic origin, with hemiparetic sequel in the upper limb, could understand simple instructions, perform community gait, and had a good sitting balance. They concluded that reaching training with trunk restraint by a harness that limited the trunk movements.

**Ana maria lotta et al.,(2013)** Study about the effect of trunk restraint on recovery of stroke. Reaching movements made with the affected arm in hemiparetic patients are often accompanied by compensatory trunk or shoulder girdle movements, which extend the reach of the arm. We investigated the effects of the suppression of these compensatory movements on reaching ability in hemiparetic individuals. Reaching movements made with the affected arm in hemiparetic patients are often accompanied by compensatory trunk or shoulder girdle movements, which extend the reach of the arm. We investigated the effects of the suppression of these compensatory movements on reaching ability in hemiparetic individuals. Appropriate treatments, such as trunk restraint, may be effective in uncovering latent movement patterns to maximize arm recovery in hemiparetic patients.

**Michaelsen et al.,(2011)** Study about the short-Term Effects of Practice With Trunk Restraint on Reaching Movements in Patients With Chronic Stroke. A total of 28 patients with hemiparesis were assigned to 2 groups: 1 group practiced reach-to-grasp movements during which compensatory movement of the trunk was prevented by a harness (trunk restraint), and the second group practiced the same task while verbally instructed not to move the trunk (control). Kinematics of reaching and grasping an object placed within arm's length were recorded before, immediately after, and 24 hours after training. The trunk restraint group used more elbow extension, less anterior trunk displacement, and had better interjoint coordination than the control group after training, and range of motion was maintained 24 hours later in only the trunk restraint group.

## **CHAPTER - 3**

### **METHODOLOGY**

#### **3.1 Study design :**

Experimental study , Comparative in nature.

#### **3.2 Study setting:**

This study was conducted at Outpatient department, Leonard hospital, batlagundu.

#### **3.3 Sample Size:**

- Twenty subjects who fulfilled inclusion and exclusion criteria were selected and randomly divided into two groups, group A and group B.
- Group A consisted of 10 subjects who received motor relearning programme with trunk restraint .
- Group B consisted of 10 subjects who received motor relearning programme without trunk restraint .

#### **3.4 Criteria for selection**

##### **3.4.1 Inclusion Criteria:**

- Brunnstorm stage 4
- Age between 45 to 65 years.
- Both males and females.
- Patients who can attain shoulder flexion minimum 90 degree
- patients with ACA stroke

### **3.4.2 Exclusion Criteria:**

- cerebellar lesions
- Bony restrictions of the affected upper limb
- patients with epilepsy
- psychiatric patients
- shoulder hand syndrome
- perceptual / cognitive deficit.

### **3.5 Study duration:**

Three months

### **3.6 Variables:**

Independent Variables:

Motor relearning programme with trunk restraint

Motor relearning programme without trunk restraint

Dependent Variables:

Activities of daily living

### **3.7 Measurement tools**

### **Chedoke arm and hand activity inventory scale**

The chedoke arm and hand activity inventory scale was taken to evaluate the functional ability of the hemiplegic arm and hand to perform tasks that have been identified as important by stroke survivors. It is not designed to measure the client's ability to complete the task using only their unaffected hand, but rather to encourage bilateral function. When attempting each task, always consider safety,( Ms. Barreca )

### **Reliability**

Reproducibility of the CMSA has been established, however, reliability of and intrarater reliability, as appropriate, in regards to administration and scoring guidelines and clinical application. Following testing, intrarater reliability was 0.93-0.98 and interrater reliability was 0.85-0.96 for Impairment Inventory and 0.98 for Activity Inventory. Test-retest reliability for the total scores ranged from 0.97 to 0.99.

### **Validity**

The CMSA has not been validated for use on patients who are less than one week post-stroke. Construct and concurrent validities were studied and confirmed that the Impairment Inventory total score was found to correlate with the Fugl-Meyer Test ( $r = 0.95$ ,  $p < 0.001$ ) and the Activity Inventory with the Functional Independence Measure ( $r = 0.79$ ,  $p < 0.05$ ).

The minimal clinically important difference (MCID) of the CMSA for neurological patients, including those with stroke, is 7 points when determined by a physiotherapist and 8 points when determined by patients with stroke and caregivers.

Overall, studies confirm that the CMSA yields both reliable and valid results. The CMSA can be used with confidence as both a clinical and a research tool that can discriminate among subjects and evaluate patient outcomes.

### **3.8. Test administration**

#### **Upper extremity function assessment by chedoke mc master scale**

The chedoke mc master scale was taken to assess the upper extremity function before and after treatment. The seven point activity scale is used to measure the impairments of the upper extremity with grades ranging from 7-complete independence to 1- total assistance.

### **3.9 Treatment procedure**

The study was carried out in 4 steps.

STEP 1 ; pre test of all participants regarding the dependent variables

STEP 2 : divide the subject randomly into two groups.

STEP 3: treatment interventions

STEP 4 : post test of all participants regarding the dependent variables.

The subject was given a detailed explanation of the procedure orally followed by the demonstration. The subject was asked to perform the technique and if any correction was made by thorough observation. The treatment program was given for a period of 6 weeks ..Each task was given a period of three minutes.

The task which includes was;

1. Open jar of bottle
2. To dial a phone
3. Draw a line with a ruler
4. Pour a glass of water
5. Do up five buttons
6. Wring out washcloth
7. Dry back with towel
8. put toothpaste on brush
9. Clean a pair of eyeglasses
10. Place container on table

#### **Group A- Motor relearning programme with trunk restraint**

**Patient position:** sitting on a chair with backrest with the hands placed on the table with elbow flexed 90 degree, trunk movement were prevented by body and shoulder belts are attached to the chair back.

**Therapist position:** stand lateral to the patient

#### **procedure**

- During Motor relearning program with trunk restraint, subjects were seated in a chair close to a table.
- The compensatory trunk movements was restricted by using belt attached to the chair back.
- subjects were instructed to draw a straight line by the scale using both of their hands. The pencil, scale are set at top edge of paper. Paper placed at the corner of the table.

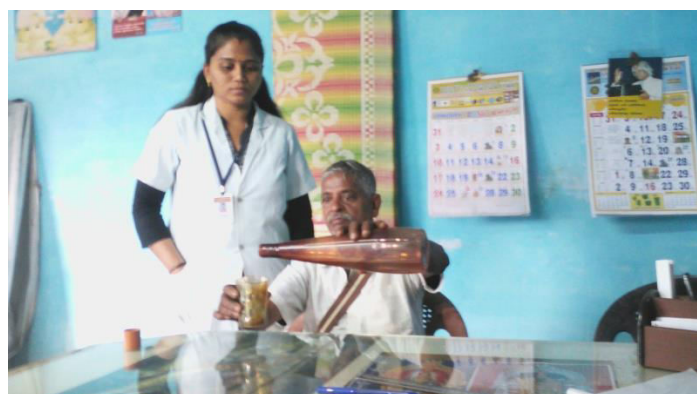
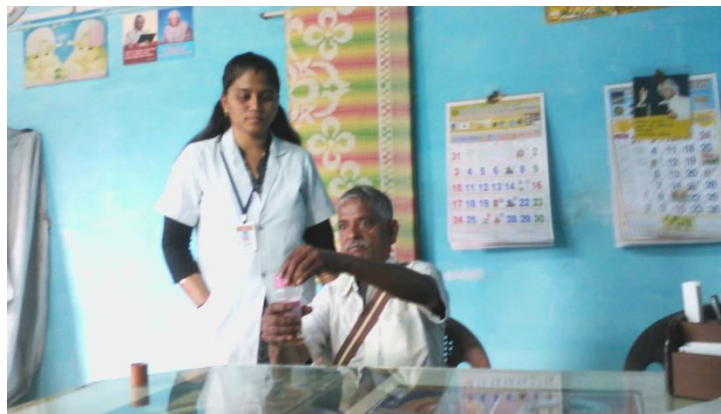


- The subject could reach and picks up the pencil, maintain the grip on the pencil and instructed to draw a line on the paper.
- The practice consisted of shoulder movements, elbow flexion, wrist movements followed by finger movements on non- paretic hands.

The effect of motor relearning programme with trunk restraint, limiting trunk motion in patients after stroke has been to encourage more normal elbow and shoulder motion during the activities

- During an 6 week training program, patients were asked to try the activities, with the restriction of compensatory movement.

**Dose:** 90 minutes per day, in five days a week .



**FIGURE -1 Shows Motor relearning programme with trunk restraint**

## **Group B - Motor relearning programme without trunk restraint**

**Patient position:** sitting on a chair with back rest in elbow flexed 90 degree .

**Therapist position:** stand lateral to the patient.

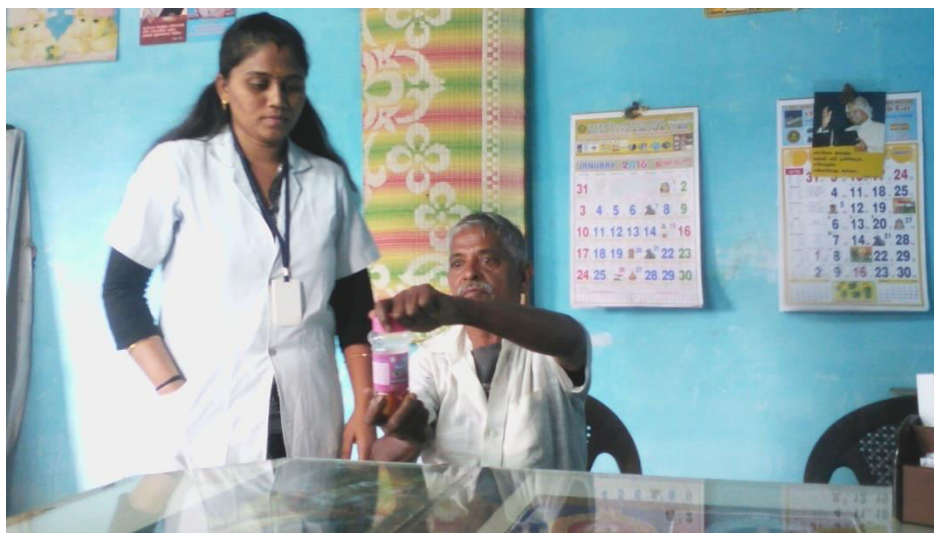
### **Procedure:**

- The subject was made to sit comfortably with back support.
- The subject was instructed to draw a line with scale using both hands and they were instructed not to rest forearms on the table.
- The pencil and scale were set at top edge of paper, it was placed at the corner of the table.
- The arm mobility and stabilization was assessed by the therapist, the subject pick and grip of the ruler are analyzed.

In this technique, motor relearning programme the patient would use the trunk movement with the help of trunk to complete the task.

To compensate the upper limb impairment, participants with hemiparesis can use alternative strategies to improve functional arm and hand use. When the active range of arm motion is decreased, individuals can transport the hand to the object by using the trunk. This increased trunk recruitment is a compensatory mechanism by which the central nervous system may extend the reach of the arm when the control of the active range of the arm joints is limited.

Dose: 90 minutes per day in five days a week.



**FIGURE -2 Shows Motor relearing programme without trunk restraint**

### **3.10 Collection of data**

The selected 20 stroke subjects were divided into 2 groups

**Group A** – Motor relearning programme with trunk restraint

**Group B** – Motor relearning programme without trunk restraint

Both the experimental groups were given treatment for continues of 6 week.

Before and after the completion of 6 week treatment intervention,upper extremity function was evaluated by chedoke mc master scale.

### **3.11 Statistical technique**

The collected data were analysed by paired‘t’ test to find out significance difference between pre and post test values of experimental groups and further unpaired ‘t’ test was applied to find out the difference between groups

## CHAPTER IV

### DATA ANALYSIS AND RESULTS

#### 4.1. Data analysis

This chapter deals with the systematic presentation of the analyzed data followed by the interpretation of the data

##### a) Paired 't' test

$$\bar{d} = \frac{\sum d}{n}$$

$$s = \frac{\sqrt{\sum d^2 - \frac{(\sum d)^2}{n}}}{n-1}$$

$$t = \frac{\bar{d}\sqrt{n}}{s}$$

Where,

**d** – Difference between pre test and post test values

$\bar{d} = \frac{\sum d}{n}$  Mean of difference between pre test and post test values

**n** – Total number of subjects

**s** – Standard deviation

##### b) Un paired t' test

$$s = \sqrt{\frac{\sum (x_1 - \bar{x}_2)^2 + \sum (x_2 - \bar{x}_2)^2}{n_1 + n_2 - 2}}$$

$$T = \frac{\bar{x}_1 - \bar{x}_2}{s} \sqrt{\frac{n_1 n_2}{n_1 + n_2}}$$

**Where,**

$S$  = Standard deviation

$n_1$  = Number of subjects in Group A

$n_2$  = Number of subjects in Group B

$\bar{x}_1$  = Mean of the difference in values between pre-test and post-test in Group- A

$\bar{x}_2$  = Mean of the difference in values between pre-test and post-test in Group- B

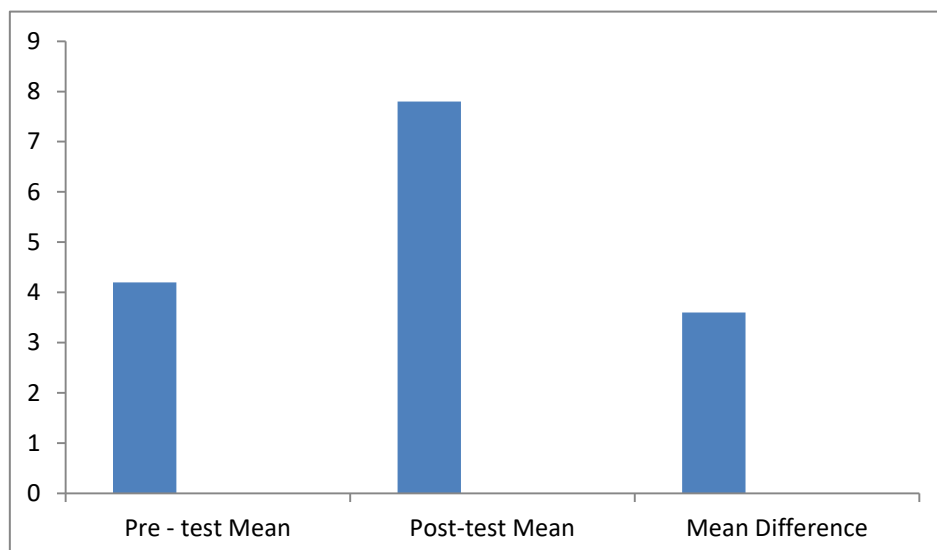
**Table 1**

The table shows mean value, mean difference, standard deviation and paired 't' value between pre test mean, post test scores of frequency of upper limb movement for group A.

Measurement	Mean	Mean Difference	Standard Deviation	Paired't' value
Pre – test	4.2			
Post test	7.8	3.6	0.547	14.7 *

\* 0.005 level of significance

In Group A for frequency of upper limb movement the calculated paired't' value is 14.7 and't' table value is 2.132at 0.005 level. Since the calculated't' value is more than 't' table value above value shows that there is significant frequency of upper limb movement following motor relearning programme with trunk restraint among stroke subjects.



**Figure: 3 - Shows the pre test mean, post test mean and mean difference of frequency of upper limb movement for group A.**



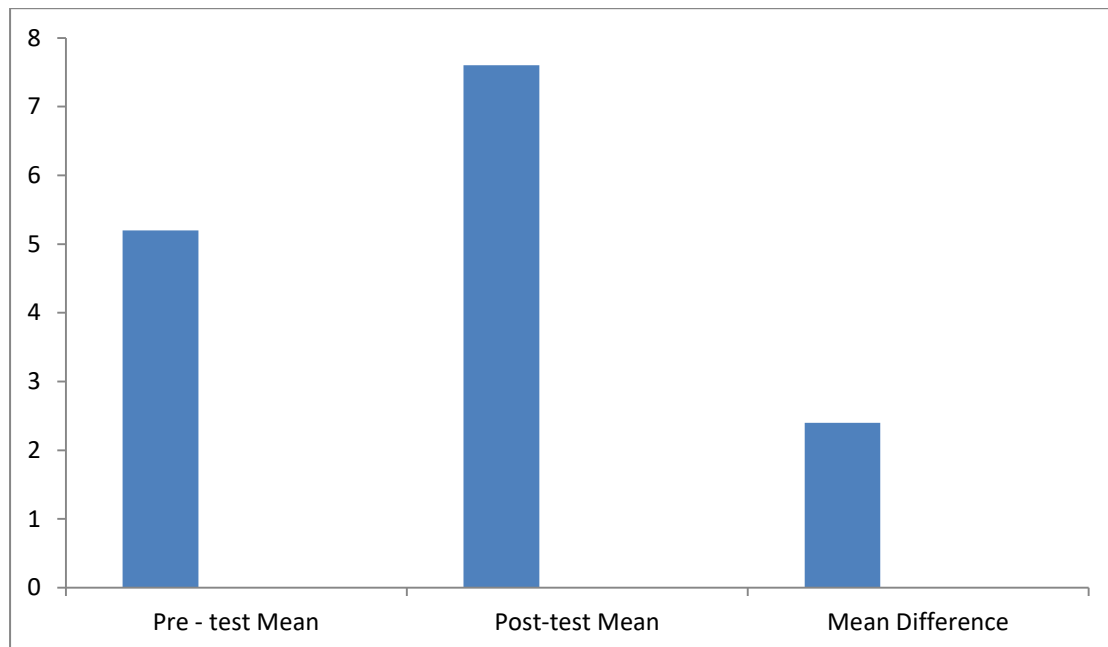
**Table 2**

**The table shows mean value, mean difference, standard deviation and paired ‘t’ value pre test and post test score of frequency of upper limb movement for group B.**

Measurement	Mean	Mean Difference	Standard Deviation	Paired ‘t’ value
Pre – test	5.2	2.4	0.89	6.01*
Post – test	7.6			

\* 0.005 level of significance

In Group B for frequency of upper limb movement the calculated paired ‘t’ value is 6.01 and table value is 2.132 at 0.005 level. Since the calculated ‘t’ value is more than ‘t’ table value above value shows that there is significant difference in frequency of upper limb movement following motor relearning programme without trunk restraint among stroke subjects.



**Figure: 4 – Shows the pre test mean, post test mean and mean difference of frequency of upper limb movement for group B.**

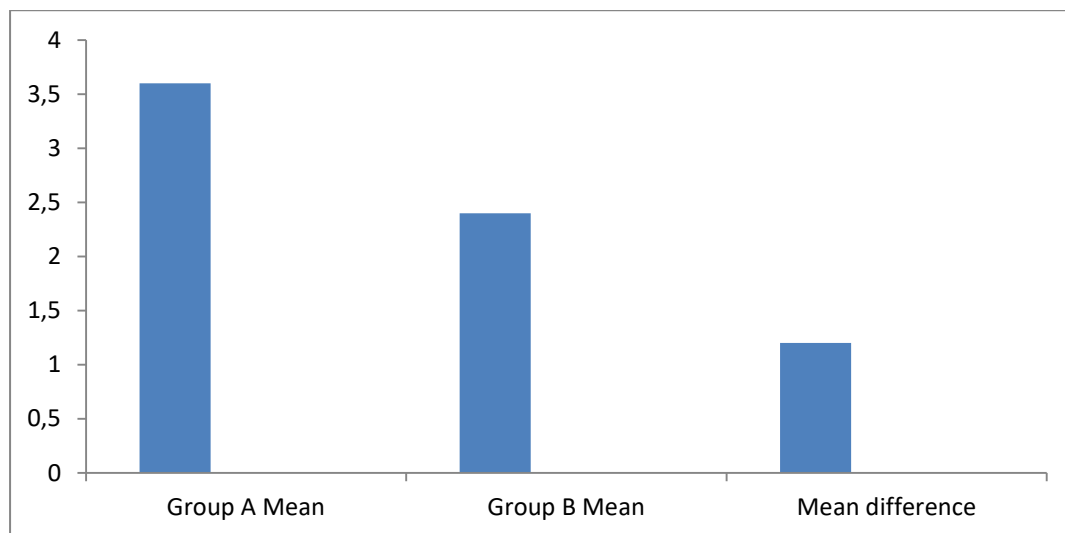
**Table 3**

**The table shows group A mean, group B mean, standard deviation and unpaired‘t’ value for frequency of upper limb movement .**

Sl. No	Variable	Mean Difference	Standard Deviation	Unpaired ‘t’ value
1.	Group A	3.6	0.741	2.543*
2.	Group B	2.4		

\* 0.005 level of significance

In Group A and B for frequency of upper limb movement the calculated unpaired‘t’ value is 2.453 at 0.005 level. Since the calculated‘t’ value is more than ‘t’ table value above value shows that there is significant difference between motor relearning program with trunk restraint and motor relearning program without trunk restraint in the management of upper limb function among stroke patients.



**Figure: 5 – Shows the group A mean, group B mean and mean difference for frequency of upper limb movement .**

## **4.2 Results:**

20 stroke patients was treated for one session a day like that 6 weeks. Before starting the treatment, upper extremity function was graded by chedoke mc master scale. The measurement was repeated at the end of the study duration.

### **Analysis of Dependent Variable of upper extremity function in Group A:**

The calculated paired 't' value is 3.87 and the 't' table value is 3.250 at 0.005 level of significance. Hence, the calculated 't' value is greater than the table 't' value there is significant difference in functional activities of upper limb following motor relearning programme with trunk restraint among stroke subjects.

### **Analysis of Dependent variable of upper extremity function in Group B:**

The calculated paired 't' value is 12.85 and the table 't' value is 3.250 at 0.005 level of significant. Hence, the calculated 't' value is greater than the table 't' value there is significant difference in functional activities of upper limb following motor relearning program without trunk restraint in stroke subjects.

### **Analysis of Dependent variable of upper extremity function between Group A and Group B:**

The calculated unpaired 't' value is 4.09 and table 't' value is 2.878 at 0.05 level of significance. Hence, the calculated 't' value is greater than table 't' value there is significant difference between motor relearning programme with trunk restraint and motor relearning programme without trunk restraint in stroke subjects.

When comparing the mean values of Group A and B, Group A subjects treated with motor relearning programme with trunk restraint showed more difference than Group B. Hence it is concluded motor relearning programme with trunk restraint is more effective than motor relearning programme in improving functional activities of upper limb among stroke subjects.

## CHAPTER V

### DISCUSSION

The study was conducted on 20 subjects. The subjects were divided into two groups, Group A and Group B. Group A received motor relearning programme with trunk restraint. Group B received motor relearning programme without trunk restraint. The study was conducted to compare effectiveness of motor relearning programme with trunk restraint and without trunk restraint in the management of upper limb functional activities among stroke patients.

*Carr et al., 1987; Johanne et al., 2006* Concluded that MRP is more effective in early enhancement of activities of daily living and ambulation starting at 2 weeks of treatment. Task specific training of MRP in initial phase of rehab helped in learning of the motor control and pattern of movement for specific activity. This early improvement in MRP can be due to early intervention and introducing normal routine of daily life. This active participation and self reliance helped in motor learning of the pattern of movement, in a given context and task. Successful performance of functional activities requires interaction between person's abilities and environmental demands. MRP focuses on training task performance in an environmental context.

Motor Relearning Program is based on task specific training which involves assessment and training in seven different task of daily life. There analysis of abnormal pattern movement in these task, correction of these abnormal patterns and repetitive practice of a task which can facilitate the development of new motor programs or the refinement of existing programs in order to improve performance of the task. It involves training & practice of these tasks in different environment and daily life situations. Present study shows that motor relearning program having significant different in upper extremity function among stroke patients.

*Richardson et al.,(2015), Hussein et al.,(2013)* Concluded that task-specific training with trunk restraint can be suggested as an effective method in improving reaching kinematics and arm movement quality in patients among stroke patients. Trunk-restraint group showed a statistically very high significant decrease in trunk displacement and increase in elbow extension voluntary range of motion. The unrestrained and unguided repetition of a motor task may reinforce compensatory movements. Trunk restraint allowed the patients to use joint ranges that were present but not recruited during unrestrained reaching.

Trunk restraint is a simple, cost-effective technique that may help to reduce compensatory trunk/shoulder/elbow movements in the post-stroke adult population. The ability to use the shoulder and elbow to perform functional reach is a primary goal in post-stroke recovery. Trunk restraint enables functional reach practice, while limiting compensatory strategies in the moderately to severely impaired stroke population. The purpose of the application of trunk restraint during the practice of upper limb tasks is to improve arm motor function by providing more appropriate afferent information to the central nervous system from the affected arm to facilitate the reappearance of more efficient movement pattern. Present study shows that motor relearning programme with trunk restraint having significant difference in upper extremity function among stroke patients. So, this technique is very useful in the management of upper extremity function among stroke patients.

## **CHAPTER VI**

### **CONCLUSION**

An experimental study was conducted to investigate the effectiveness of motor relearning programme with trunk restraint and motor relearning programme without trunk restraint in the management of stroke.

20 patients with stroke were included in this study and randomly divided into two groups A and B each group consist of 10 subjects. Group A was treated motor relearning programme with trunk restraint. Group B was treated with motor relearning programme without trunk restraint. Upper limb movement were assessed before and after intervention by chedoke mc master scale.

The statistical result shows that there is improvement in both the groups. But when comparing both it was found that motor relearning programme with trunk restraint is more effective than motor relearning programme without trunk restraint among stroke patients.

#### **6.1 Limitations**

- This study was limited to age group between 45 - 65 yrs only.
- The study sample size was small.
- The duration of treatment can be increased.
- This study was limited only to the MCA artery involvement.
- Only upper limb activities are involved.
- Sensory problems were not taken in considerations.

## **6.2 Recommendation**

- A study can also be done for the other age groups.
- A study can also be done using large population.
- A study can also be done with other form of exercise combination to know the effect of combined treatment.
- A study can be done with different variables.
- Number of subject can be increase.

## CHAPTER VII

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## CHAPTER VIII

### ANNEXURES

#### ANNEXURE - 1

##### ASSESSMENT CHART

Physical Therapy assessment chart

##### Subjective assessment:

Name

Age

Sex

Occupation

Chief Complaints

##### Medical history

a)Past medical history:

b)Present illness:

Family/Social History

Associated problems

Vital signs

Temperature	Pulse rate	Respiratory rate	Blood pressure

## **Objective assessment**

### **On observation**

Built

Posture

Attitude of limbs

Muscle wasting

Edema

Involuntary movement

Gait

Deformity

### **On Palpation**

Tenderness

Swelling

Muscle tightness

Warmth

Other if any

### **Pain assessment**

Side

Site

Duration

Nature

Aggravation factor

Relieving factor

Other if any

## **On examination**

### **Higher function**

- Consciousness
- Cognition
- Orientation
- Attention span
- Memory
- Abstract thinking
- Insight, judgement, planning
- Spatial
- Perception.

### **Speech**

- Sound production
- Articulation
- Understanding & expressing words

### **Hearing**

#### **Cranial nerves**

- Olfactory
- Optic
- Oculomotor, Trochlear, Abducement

- Trigeminal
- Facial nerve
- Vestibule cochlear
- Glossopharyngeal
- Vagus
- Accessory
- Hypoglossal

### **Musculoskeletal system**

- Fracture
- Muscle contracture
- Joint stiffness
- Joint subluxation
- osteoporosis

### **Reflexes**

- Superficial
- Deep
- Primitive
- Pathological

## **Co ordination**

- Equilibrium assessment
- Non equilibrium assessment

## **Balance**

- Static
- Sitting
- Standing
- Balance reaction

## **Hand function**

- Power and precision grip
- Reaching
- Grasping
- Releasing

## **Functional Assessment**

- ADL
- Functional status ( Disease specific scales)

Diagnosis

Problem list

Short term & long term goals.

## **ANNEXURE – 2**

### **DESCRIPTION OF THE LEVELS OF FUNCTION FOR THE CHEDOKE ACTIVITY SCALE**

**7 COMPLETE INDEPENDENCE** - All of the tasks are performed safely, without modification, assistive devices or aids, and within reasonable time.

**6 MODIFIED INDEPENDENCE** - Activity requires any one or more of the following: an assistive device, more than reasonable time, or there are safety (risk) considerations.

**5 SUPERVISION** - The client requires no more help than standby, cueing or coaxing, without physical contact. A helper sets up needed items or applies orthoses.

**4 MINIMAL ASSISTANCE** - With physical contact the client requires no more than touching, and client expends 75% or more of the effort.

**3 MODERATE ASSISTANCE** - Weak limb **manipulates and stabilizes** during the task. The client requires more help than touching, or expends

**2 MAXIMAL ASSISTANCE** - Weak limb stabilizes during task. The client expends less than 50% of the effort, but at least 25%.

**1 TOTAL ASSISTANCE** - The client expends less than 25% of the effort.



### ANNEXURE - 3

#### EQUIPMENT REQUIRED :

height adjustable table
chair/wheelchair belt to restraint trunk
200g jar of an container
push-button telephone
12"/30cm ruler
8.5" x 11" paper
pencil
250 ml plastic cup
wash cloth shirt with 5 buttons bath towel

## ANNEXURE -4

### The 6 stages of brunnstorm approach:

Stage	Description
1	Immediately following a <a href="#">stroke</a> there is a period of <a href="#">flaccidity</a> whereby no movement of the limbs on the affected side occurs.
2	Recovery begins with developing <a href="#">spasticity</a> , increased reflexes and <a href="#">synergic</a> movement patterns termed <b>obligatory <a href="#">synergies</a></b> . These <b>obligatory <a href="#">synergies</a></b> may manifest with the inclusion of all or only part of the synergic movement pattern and they occur as a result of reactions to stimuli or minimal movement responses.
3	<a href="#">Spasticity</a> becomes more pronounced and <b>obligatory <a href="#">synergies</a></b> become strong. The patient gains voluntary control through the synergy pattern, but may have a limited range within it.
4	<a href="#">Spasticity</a> and the influence of synergy begins to decline and the patient is able to move with less restrictions. The ease of these movements progresses from difficult to easy within this stage.
5	<a href="#">Spasticity</a> continues to decline, and there is a greater ability for the patient to move freely from the synergy pattern. Here the patient is also able to demonstrate isolated joint movements, and more complex movement combinations.
6	<a href="#">Spasticity</a> is no longer apparent, allowing near-normal to normal movement and coordination

## **ANNEXURE - 5**

### **PATIENT CONSENT FORM**

I . . . . . Voluntarily consent to participate in the research named on **“A COMPARATIVE STUDY ON THE EFFECTIVENESS OF MOTOR RELEARNING PROGRAMME WITH TRUNK RESTRAINT AND WITHOUT TRUNK RESTRAINT IN THE MANAGEMENT OF UPPER LIMB FUNCTIONAL ACTIVITIES AMONG STROKE PATIENTS ”**.

The researcher has explained me the treatment approach in brief, risk of participation and has answered the questions related to the study to my satisfaction.

**Signature of patient**

**Signature of researcher**

**Signature of witness**

**Date :**

**Place :**